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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
NEWMAN, MICHAEL A	

ART UNIT	PAPER NUMBER
2609	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/736,686	CHEN ET AL.	
	Examiner	Art Unit	
	Michael A. Newman	2609	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 January 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) *18* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17,19 and 20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *28/Jan/2004, 9/Feb/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities: Several typographical errors/omissions were noticed including:

a. Page 1, line 19 – "...identified is *the* human body..."

b. Page 2, line 7 – "...wherein a plurality *of* areas..."

c. Page 6, line 24 – "... Fig. 2 shows *a* processed image..."

d. Page 15, line 11 – "...which generate*s* a list of candidate..."

Appropriate correction is required.

Claim Objections

2. Claims 4 – 9, 18 and 20 are objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claim **shall only refer to other claims as to form *alternative* embodiments. As an example, consider "any *one* of claims 1 to 3" or "any of claims 1, 2, *or* 3"** See MPEP § 608.01(n). Accordingly, **claim 18** has not been further treated on the merits.

Claim Rejections - 35 USC § 101

3. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

4. Claims 19 and 20 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

a. Regarding claims 19 and 20, **the claims are not statutory as they are directed to program codes *per se*.** Any *computer executable* software code

must be stored in a *computer readable storage medium* to enable the underlying functionality. **A structural and functional interrelationship between the computer program and the structural elements of the computer, which would permit its functionality to be realized, should be included in the claim. Note a "storage medium" is not necessarily sufficient to enable the functionality of the program codes.**

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. Claims 1, 2, 3, 5, 6, 7, 8 11, 12, 13, 14, 15, 16, 17, 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki (U.S. Patent No. 5,859,921) in view of Ando (U.S. Patent No. 5,008,946). Hereinafter referred to as Suzuki and Ando respectively.

a. Regarding claim 1, 11, 15 and 19 Suzuki teaches a human eye detection method and apparatus comprising the following: reading means **(Suzuki Fig. 1 – element 1)** for reading in an image; **(Suzuki Fig. 2 - step 1)**; candidate detection means **(Suzuki Fig. 1 – elements 4 and 5)** for analyzing the image and getting a list of candidate eye areas; **(Suzuki Fig. 2 – step 5)**; and output means **(Suzuki Fig. 1 – output of element b)** for outputting the list for purpose of subsequent processing of the image;

characterized in that, the apparatus further comprises selecting means for selecting one unverified candidate eye area from said list **(Suzuki Fig. 2 – element 6)**; verifying means **(Suzuki Fig. 1 – element 6)** for determining whether said one candidate eye area is a true eye area, and outputting the result; and controlling means **(Suzuki Fig. 1 – element 6) [Note that the eye area detection means is a recursive process as detailed in Fig. 9]** for controlling the selection means so that all candidate eye areas in the list are verified, the verifying means further including:

neighborhood region determining means for determining a neighborhood region of the selected candidate eye area **(Suzuki Col. 20 lines 60 – 62)**; Suzuki goes on to teach an eye area function (EFV) to validate the candidate eye regions **(Suzuki Col. 21 lines 26 – 34),** if the candidate eye area is determined as a real eye area it remains in the list; else, the candidate eye area is determined as a false eye area and deleted from the list **(Suzuki Fig. 9 – Steps S626, S621 S623 and S618) [Note that Fig. 9 teaches the eye-evaluation**

step; furthermore, by setting the appropriate flag for each eye region, they are effectively removed from or affirmed to the candidate list], and repeating the steps until there is no unverified candidate eye area in the list; and outputting the list for purpose of subsequent processing of the image **(Suzuki Fig. 9 – Step S624). However Suzuki fails to teach an eye-evaluation process involving** (1) calculating means for calculating the neighborhood region's size, which is recorded as S; (2) dark area determining means for processing the region and obtaining dark areas; (3) means for counting the number of dark areas, which number is recorded as N; (4) comparing means for comparing the ratio N/S to a predetermined first threshold; if the ratio N/S is smaller than said first threshold, the candidate eye area is determined as a real eye area and remains in the list; else, the candidate eye area is determined as a false eye area and deleted from the list. **Pertaining to the same field of endeavor, Ando teaches** a pupil detection system in which the validity of a detected pupil is determined for the purposes of setting a variable threshold. Ando teaches (1) obtaining the total number 'S' of pixels contained in a region 'S_d' (which contains the eye area) **(Ando Col. 18 – lines 34 – 35)**, (2-3) obtaining the number of black pixels 'S_b' in the region 'S_d', **(Ando Col. 18 – lines 31 – 32)**, (4) comparing the ratio S_b/S to thresholds **(Ando Col. 18 - line 38)** and if the ratio does not lie within a range, deeming the area unsatisfactory [i.e. not correctly detected as an eye region] and requiring a correction to the threshold value. **Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was**

made to modify Suzuki by substituting the eye evaluation function, EFV, generating step as taught by Suzuki with the valid eye region detection method as taught by Ando in order to greatly simplify the eye-region verification process by eliminating the need to evaluate the complexity and maximum of the histogram (Suzuki Fig. 9 – steps S607 and S608 respectively) as well as finding the product of two auxiliary functions EFV1 and EFV2 (Suzuki Fig. 9 – step 609) and replacing it with a simple pixel-counting/image-area sizing scheme.

Regarding claim 19, Suzuki is silent as to whether the implementation of the aforementioned steps is as program code or discrete logic elements; however, Ando teaches the implementation of the eye detection method using a microprocessor with corresponding ROM and RAM **(Ando Fig. 1 elements 8,9 and 10) [See also Col. 7 lines 27 – 30]**. Such microprocessors clearly rely on coded instructions to perform the desired operations. **Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to realize the steps taught by Suzuki and Ando by way of processor-executable program code in order to reduce cost and speed development by eliminating multiple discrete components as well as exploiting the flexibility of a programmable device.**

b. Regarding claims 2 and 16, Suzuki in view of Ando teach all the limitations of the parent claims 1 and 15 respectively as set forth in the 103 rejection of claims 1 and 15 above. **Suzuki also teaches** determining candidate face areas

on the basis of remnant candidate eye areas obtained from said step j, deleting false face areas; outputting the remnant face areas for subsequent processing **(Suzuki Col. 7 lines 33 – 40)**.

c. Regarding claims 3 and 17, Suzuki in view of Ando teach all the limitations of the parent claims 2 and 17 respectively as set forth in the 103 rejection of claim 2 and 17 above. **Suzuki further teaches** that the determining step comprises, for each pair of remnant candidate eye areas, determining two candidate face areas based on the centers of said pair of candidate eye areas, the distance between said centers and the inherent ratios in the face of human being **(Suzuki Col. 7 lines 50 – 61)**.

d. Regarding claims 5, 6, 12 and 13, Suzuki in view of Ando teach all the limitations of the parent claims 1-3 and 11 respectively as set forth in the 103 rejection of claims 1-3 and 11 above. **Suzuki also teaches** correctly obtaining characteristic features of a face image by converting it into a binary image **(Suzuki Col. 3 lines 25 – 28)**. In the pupil detection method taught by Ando used to modify Suzuki, **Ando also teaches** that the region surrounding the eye, 'S_d' is also binarized using a threshold value so as to easily separate regions whose grey levels change rapidly (i.e. potential eyes) from the background within the region **(Ando Col. 4 lines 33 – 42)**. **Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to binarize both the entire image and the candidate eye regions by thresholding their grey scale values in order to easily differentiate dark**

regions (potential eye regions) from background regions while avoiding the need for additional/redundant processing steps for each.

e. Regarding claim 7, Suzuki in view of Ando teach all the limitations of the parent claims 1-3 as set forth in the 103 rejection of claims 1-3 above. In the pupil-detection method used to modify Suzuki, **Ando also teaches** as part of the method storing the threshold or range comparison values, K, in a register prior to the ratio comparison **(Ando Col. 65 – 64)**. **Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to store the threshold value prior to the comparison step in order to enable the processor to complete the comparison.**

f. Regarding claims 8 and 14, Suzuki in view of Ando teach all the limitations of the parent claims 1-3 and 11 respectively as set forth in the 103 rejection of claims 1-3 and 11 above. In the pupil-detection method used to modify Suzuki, **Ando also teaches** as part of the method, a threshold or comparison value, K, calculating step prior to the ratio comparison **(Ando Col. 20 lines 59 – 63)**. **Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to have a variable threshold or comparison value calculation so as to optimize the pupil detection criteria based on individual input image.**

g. Regarding claims 9 and 10, Suzuki in view of Ando teach all the limitations of the parent claims 1-3 as set forth in the 103 rejection of claims 1- 3 above. In the pupil-detection method used to modify Suzuki, **Ando also teaches** setting a

threshold or comparison value, K, to 0.4 and if necessary modifying it to 0.28 **(Ando Col. 18 line 40 and Col. 20 lines 59 – 63). Official notice is taken of the fact that it is notoriously old and well known in the image analysis art to modify thresholding parameters during the course of routine optimization/experimentation. It would have been obvious to one of ordinary skill in the art at the time the invention was made to set the threshold by to a value perceived to result in optimum results such as 0.015, 0.4, etc.** [One of ordinary skill in the art would have been motivated to have had a threshold between 0.15 and 0.0015 since such a range, absent any criticality (i.e. unobvious and/or unexpected result(s)), is generally achievable through routine optimization/experimentation, and since discovering the optimum workable ranges, where the general conditions of a claim are disclosed in the prior art, involves only routine skill in the art, *In re Aller*, 105 USPQ 233 (CCPA 1995). Moreover, in the absence of any criticality (i.e., unobvious and/or unexpected result(s)), the parameter set forth above would have been obvious to a person having ordinary skill in the art at the time the invention was made, *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).]

h. Regarding claim 20, Suzuki in view of Ando teach all the limitations of the parent claims 1 and 3 as set forth in the 103 rejection of claims 1 and 3 above. However, Suzuki is silent as to whether the implementation of the aforementioned steps is as program code or discrete logic elements. Ando teaches the implementation of the eye detection method using a microprocessor

with corresponding ROM and RAM **(Ando Fig. 1 elements 8,9 and 10) [See also Col. 7 lines 27 – 30]**. Such microprocessors clearly rely on coded instructions to perform the desired operations. **Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to realize the steps taught by Suzuki and Ando by way of processor-executable program code in order to reduce cost and speed development by eliminating multiple discrete components as well as exploiting the flexibility of a programmable device.**

8. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki (U.S. Patent No. 5,859,921) in view of Ando (U.S. Patent No. 5,008,946) as applied to claims 1-3 above, and further in view of Kinjo (U.S. Patent No. 5,629,752). Hereinafter referred to as Suzuki, Ando and Kinjo respectively.

a. Regarding claim 4, Suzuki in view of Ando teach all the limitations of the parent claims 1-3 as set forth in 103 rejection of claims 1-3 above. **However, they fail to teach that** a batch of said unverified candidate eye areas is selected from the list, and the steps d) to h) are implemented for each unverified candidate eye area in the batch in parallel. **Pertaining to the same field of endeavor, Kinjo teaches a facial feature recognition method. Kinjo teaches that since the region determination steps (Kinjo Fig. 15) are not affected by the result of other processing, once the image has been divided into a plurality of regions, the respective steps can be carried out in parallel by**

the processing units. Kinjo further teaches that such an arrangement will substantially reduce the processing time (Kinjo Col. 39 line 62 to Col. 40 line 8). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to implement the eye recognition steps taught by Suzuki and Ando in parallel as taught by Kinjo to reduce the processing time. Furthermore, Suzuki teaches the ability to operate on a real time basis. However, it is well known in the art that batch processing is a regression from real-time processing, and is suitable for applications that do not require real-time interaction while enjoying less demanding processing requirements.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a. Lin et al. (U.S. Patent No. 6,016,354) teaches a red-eye reduction system in which pupils are located by binary masking the eye region and finding the largest 'white' area.

b. Kim (U.S. Patent No. 6,072,892) teaches eye position detection apparatus which calculates the histogram area corresponding to dark pixels. The largest area being regarded as the eye position.

c. Hong et al. (U.S. Patent No. 6,633,655) a method for detecting human faces by detecting eyes and nose and evaluating their location based on known geometric constraints.

d. Chen et al. (U.S. Patent No. 6,965,684) teaches human feature detection system which incorporates validating eye-circle dimensions to determine eye area.

e. Lambert (U.S. Patent No. 5,012,522) teaches a face recognition machine which uses a pair of similarly shaped adjacent dark ellipses as an 'eye signature' to validate the detection of eyes.

f. Chamberlain (U.S. Patent No. 6,980,692) teaches a system to delineate features within an image using dynamic thresholding in which the threshold is determined by evaluating the closeness of ratio of the black pixels to the total number of pixels to a target ratio.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael A. Newman whose telephone number is (571) 270-3016. The examiner can normally be reached on Mon - Thurs from 8:30am to 6:30pm (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chris Kelley can be reached on (571)-272-7331. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

M.A.N.

KENT CHANG
PRIMARY EXAMINER